

WE CLAIM:

1. A joint for connecting a duct to a port comprising:
an annular flange, having a sealing flange disposed radially outward therefrom, the collar fixedly attached to the duct;
a female mating flange, having female threads disposed internally thereon, the female mating flange fixedly attached to the port; and
5 an annular seat collar having male threads disposed externally thereon; wherein
the male threads are threadably attachable to the female threads;
and
10 the annular seat collar having a surface contacting the sealing flange when the joint is assembled.
2. The joint according to claim 1, further comprising a bellows seal sealingly positioned between the sealing flange and the female mating flange.
3. The joint according to claim 1, further comprising a locking ring disposed over at least a portion of a circumference of the female mating flange.
4. The joint according to claim 3, wherein the locking ring is disposed in a channel in the female mating portion.
5. The joint according to claim 4, further comprising a plurality of tabs spaced around an outer annular surface of the annular seat collar.
6. The joint according to claim 5, wherein end portions of the locking ring are bent outward from the channel between adjacent tabs, thereby preventing rotational motion of the annular seat collar when the joint is assembled.

7. The joint according to claim 1, wherein the joint has a length of less than about 2.5 inches, and a diameter of less than about 1.1 inches greater than the diameter of the duct.

8. The joint according to claim 1, wherein the joint has a length of less than about 1.5 inches, and a diameter of about 1.0 inch greater than the diameter of the duct.

9. The joint according to claim 1, further comprising:
a protuberance on a distal end, relative to the port, of the female mating flange; and
a radial face axially positioning the annular seat collar to contact
5 the protuberance when the annular seat collar is threadably attached the port, thereby maintaining the working cavity length for the joint.

10. The joint according to claim 1, further comprising a grip integrally formed with the annular seat collar, the grip allowing for a user to threadably mate the annular seat collar with the female mating flange, thereby assembling the joint.

11. The joint according to claim 1, wherein the duct is attached to the annular flange with a weld.

12. The joint according to claim 1, wherein the port is attached to the female mating flange by either a weld or by forming the port integrally with the female mating flange.

13. The joint according to claim 1, wherein the duct is used to duct air from a compressor to a combustor of a turbomachine.

14. The joint according to claim 13, wherein the turbomachine is used to power an aircraft.

15. A low profile tension style flexible joint comprising:
an annular flange, having a sealing flange disposed radially outward therefrom, the collar fixedly attached to the duct;
a female mating flange, having female threads disposed internally thereon, the female mating flange fixedly attached to the port;
5 an annular seat collar having male threads disposed externally thereon;
a bellows seal sealingly positioned between the sealing flange and the female mating flange; and
10 a locking ring disposed over at least a portion of a circumference of the female mating flange; wherein
the male threads threadably attach the female threads; and
the annular seat collar having a spherical portion contacting the sealing flange when the joint is assembled.

16. The joint according to claim 15, wherein the locking ring is disposed in a channel in the female mating portion.

17. The joint according to claim 16, further comprising:
a plurality of tabs spaced around an outer annular surface of the annular seat collar; wherein
end portions of the locking ring are bent outward from the channel
5 between adjacent tabs, thereby preventing rotational motion of the annular seat collar when the joint is assembled.

18. The joint according to claim 15, wherein the joint has a length of less than about 1.5 inches and a diameter of about 1.0 inch greater than the diameter of the duct.

19. The joint according to claim 15, further comprising:
a protuberance on a distal end, relative to the port, of the female mating flange; and
a radial face axially positioning the annular seat collar to contact
5 the protuberance when the annular seat collar is threadably attached the port, thereby maintaining the working cavity length for the joint.

20. The joint according to claim 15, further comprising a grip integrally formed with the annular seat collar, the grip allowing a user to threadably mate the annular seat collar with the female mating flange, thereby forming the joint.

21. The joint according to claim 15, wherein:
the duct is attached to the annular flange with a weld; and
the port is attached to the female mating flange by a weld or by
forming the port integrally with the female mating flange.

22. A low profile tension style flexible joint for use in ducting compressor air to a turbomachine combustor, comprising:

an annular flange, having a sealing flange disposed radially outward therefrom, the collar fixedly attached to the duct;

5 a female mating flange, having female threads disposed internally thereon, the female mating flange fixedly attached to the port;
a annular seat collar having male threads disposed externally thereon;

10 a bellows seal sealingly positioned between the sealing flange and the female mating flange;

a protuberance on a distal end, relative to the port, of the female mating flange;

15 a radial face axially positioning the annular seat collar to contact the protuberance when the annular seat collar is threadably attached the port, thereby maintaining the working cavity length for the joint; and

a locking ring disposed in a channel over at least a portion of a circumference of the female mating flange; wherein

the male threads threadably attach to the female threads;

20 the annular seat collar having a spherical portion contacting the sealing flange when the joint is assembled; and

the joint has a length of less than about 1.5 inches and a diameter of about 1.0 inch greater than the diameter of the duct.

23. The joint according to claim 22, further comprising:

a plurality of tabs spaced around an outer annular surface of the annular seat collar; wherein

5 end portions of the locking ring are bent outward from the channel between adjacent tabs, thereby preventing rotational motion of the annular seat collar when the joint is assembled.

24. The joint according to claim 22, further comprising a grip integrally formed with the annular seat collar, the grip allowing a user to threadably mate the annular seat collar with the female mating flange, thereby assembling the joint.

25. The joint according to claim 22, wherein:

the duct is attached to the annular flange with a weld; and

the port is attached to the female mating flange by a weld or the female mating flange is integral with the port .

26. A method for joining a duct and a port comprising:
 - attaching an annular flange to the duct, the annular flange having a sealing flange disposed radially outward therefrom;
 - providing a female mating flange attached to the port, the female mating flange having threads disposed internally thereon;
 - threadably engaging the female threads of the female mating flange with male threads of an annular seat collar having the male threads disposed externally thereon; and
 - threading the male threads with the female threads to a point to cause contact between a portion of the sealing flange and the annular seat collar.
- 10

27. The method according to claim 26, further comprising positioning a bellows seal between a sealing surface of the sealing flange and a sealing surface of the female mating flange.

28. The method according to claim 26, further comprising disposing a locking ring over at least a portion of a circumference of the female mating flange, the locking ring being disposed in a channel in an outer circumference of the female mating portion.

29. The method according to claim 28, further comprising:
 - bending end portions of the locking ring from the channel over an outer circumferential surface of the annular seat collar; and
 - providing a plurality of tabs on the outer circumferential surface of the annular seat collar, thereby engaging the end portions and preventing rotational motion of the annular seal collar when the joint is assembled.
- 5

30. The method according to claim 26, wherein the joint has a length of less than about 1.5 inches and a diameter of not more than about 1.0 inch greater than the diameter of the duct.

31. A pneumatic duct having at least one joint on at least one end thereof for attaching the duct to a port, the joint comprising:

an annular flange having a sealing flange disposed radially outward therefrom, the collar attached to the duct;

5 a female mating flange having female threads disposed internally thereon, the female mating flange attached to the port;

an annular seat collar having male threads disposed externally thereon;

10 a bellows seal positioned between the sealing flange and the female mating flange; and

a locking ring disposed in a channel over at least a portion of a circumference of the female mating flange; wherein

the male threads threadably attach to the female threads; and

15 the annular seat collar having a spherical portion contacting the sealing flange when the joint is assembled.

32. The pneumatic duct according to claim 31, further comprising:

a plurality of tabs spaced around an outer annular surface of the annular seat collar; wherein

5 end portions of the locking ring are bent outward from the channel between adjacent tabs, thereby preventing rotational motion of the annular seat collar when the joint is assembled.

33. The pneumatic duct according to claim 31, wherein the joint has a length of less than about 1.5 inches and a diameter of not more than about 1.0 inch greater than the diameter of the duct.

34. A turbomachine having a duct for ducting compressor air to a combustor, comprising:

 a low profile tension style flexible joint for connecting the duct to a port on the turbomachine, the low profile tension style flexible joint comprising:

5 an annular flange having a sealing flange disposed radially outward therefrom, the collar attached to the duct;

 a female mating flange having female threads disposed internally thereon, the female mating flange attached to the port;

10 an annular seat collar having male threads disposed externally thereon;

 a bellows seal sealingly positioned between the sealing flange and the female mating flange; and

 a locking ring disposed in a channel over at least a portion of a circumference of the female mating flange; wherein

15 the male threads threadably attach to the female threads; and

 the annular seat collar having a spherical portion contacting the sealing flange when the joint is assembled.

35. The turbomachine according to claim 34, wherein the low profile tension style flexible joint further comprises:

 a plurality of tabs spaced around an outer annular surface of the annular seat collar; wherein

5 end portions of the locking ring are bent outward from the channel between adjacent tabs, thereby preventing rotational motion of the annular seat collar when the joint is assembled.

36. The turbomachine according to claim 34, wherein the low profile tension style flexible joint has a length of less than about 1.5 inches and a diameter of not more than about 1.0 inch greater than the diameter of the duct.

37. The turbomachine according to claim 34, wherein the low profile tension style flexible joint further comprises:

a protuberance on a distal end, relative to the port, of the female mating flange; and

5 a radial face axially positioning the annular seat collar to contact the protuberance when the annular seat collar is threadably attached the port, thereby maintaining the working cavity length for the joint.

38. The turbomachine according to claim 34, wherein the low profile tension style flexible joint further comprises a grip integrally formed with the annular seat collar, the grip allowing a user to threadably mate the annular seat collar with the female mating flange, thereby forming the joint.

39. The turbomachine according to claim 34, wherein:
the duct is attached to the annular flange with a weld; and
the port is attached to the female mating flange by a weld or by forming the port integrally with the female mating flange.